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OBSERVATION DATA OF THE SCIENTIFIC-RESEARCH DRIFTING STATIONS
"SEVERNYY POLYUS-6" AND "SEVERNYY POLYUS-8", 1959-1960

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INTERNATIONAL GEOPHYSICAL YEAR

OBSERVATION DATA

OF THE

SCIENTIFIC-RESEARCH DRIFTING STATIONS

"SEVERNYY POLYUS-6" AND "SEVERNYY POLYUS-8"

["NORTH POLE-6" AND "NORTH POLE-8"]

1959-1960

Edited by N. A. Milyayev

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PREFACE

A complex study of the Central Arctic was made in 1959-1960 by two drifting stations, the "Severnny Polyus-6" [North Pole-6], headed by V. S. Antonov, and "Severnny-Polyus-8" [North Pole-8], in charge of V. M. Rogachev.

The period between 11 April and 10 September 1959 marked the final stage of the long steady drift of the "Severnny Polyus-6" begun in the spring of 1956 in the eastern sector of the Arctic at about 183° eastern longitude and $74^{\circ},5'$ northern latitude. In September 1959, the "Severnny Polyus-6" completed its drift in the western sector of the Arctic, near 5° eastern longitude and 82° northern latitude.

From the middle of April 1959 through April 1960, the newly organized station "Severnny Polyus-8" drifted in the eastern sector of the Arctic from 198° eastern longitude to 179° eastern longitude in the $76-79^{\circ}$ zone of the northern latitude.

Working under the IGY program, both stations carried out regular magnetic and ionospheric observations. The geophysical observations at both stations, especially at the "Severnny Polyus-8," are highly valuable as they shed some light on the little-explored Arctic regions.

The area of operations of the "Severnny Polyus-6" is also the only Arctic region whose magnetic coordinates are conjugate with those of the region of the Antarctic observatory Mirny which is making continuous geophysical observations under a broad program.

The volume also contains, in addition to the results of the geomagnetic observations, tables of the processed data on the ionospheric observations made by the "Severnny Polyus-6" in May and August 1959 which were omitted from the published data on the ionospheric observations for 1959

in vol. 250 of the transactions of the Arctic and Antarctic Institute.

The tables of ionospheric observations were compiled according to Moscow time, and include a correction for conversion to local time: 1.3 and 2.4 hours for May and August, respectively.

The Arctic and Antarctic
Scientific-Research Institute

GEOPHYSICS

MAGNETIC OBSERVATIONS

The work program on geomagnetism at the drifting stations "Severnny Polyus-6" and "Severnny Polyus-8" included the definition of the absolute values of the elements of terrestrial magnetism D, H and Z, and the continuous recording of the components of terrestrial magnetism δD , δH , δZ .

The fourth and last shift of observers at the "Severnny Polyus-6" began its work on April 11, 1959, when the station was at a point with coordinates at $86^{\circ}18'$ northern latitude and $39^{\circ}27'$ eastern longitude. The observations at the "Severnny Polyus-6" were completed on 10 September 1959 at $82^{\circ}11'$ northern latitude and $3^{\circ}57'$ eastern longitude. The magnetic observations were made by the junior scientist, V. S. Shneyer.

The "Severnny Polyus-8" went into operation on 16 April 1959. The initial coordinates of the station were $75^{\circ}32'$ northern latitude and $197^{\circ}13'$ eastern longitude. A year later, on 1 April 1960, when a new shift of observers took over, the station was at $79^{\circ}06'$ northern latitude and $179^{\circ}23'$ eastern longitude. The magnetic observations were continued by G. V. Letnikov.

The drift direction of the "Severnny Polyus-6" from 11 April through 10 September 1959, and the "Severnny Polyus-8" from 16 April 1959 through 1 April 1960 is shown in Fig. 1.

The absolute definition of the elements of terrestrial magnetism was made with the following instruments: at the "Severnny Polyus-6," by a "combine" No. 17 theodolite and M-2 No. 6353, 4115 and 15077 magnetometers; at the "Severnny Polyus-8," by a "Bamberg" No. 70018 field theodolite and M-2 No. 12172, 12151 and 7691 magnetometers.

Magnetic variation stations (MVS) were used for recording the

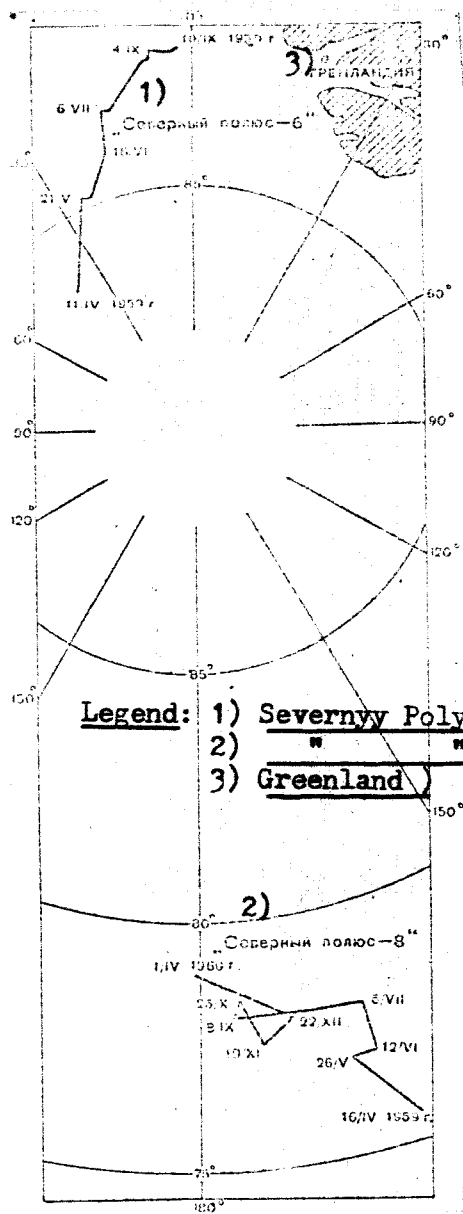


Fig. 1. The drift direction of the "Severnnyy Polyus-6" and "Severnny Polyus-8"

where A_z is the astronomical azimuth of the target;

A_m - the magnetic azimuth of the target.

The horizontal component of the Earth's magnetic field was defined by the deflection method and computed by the following formula

$$H = \frac{C \tau}{\sin \theta}$$

where $C \tau$ denotes the temperature-dependent constant of the instrument;

variations of the elements of terrestrial magnetism: an ANII-13 (base) and ANII-17 (standby) stations at "Severnnyy Polyus-6," and ANII-2 (base) and NIFI-2 (standby) stations at "Severnny Polyus-8." The standby stations were to record the strong magnetic disturbances and fill in the recording gaps of the base station during the change of the tape. The variometer multiplying factor of the standby magnetic variation stations was 1.5-2 times greater than that of the base stations, and only the declination variometers of the ANII-2 and NIFI-2 stations of the "Severnny Polyus-8" differed little from one another.

The series of declination observations consisted of ten successive magnetic sightings in 10-15 minutes. At the beginning and end of each series, observations were made of the target. The declination was computed by the following formula

$$D = A_z - A_m,$$

0 is the deflection angle of the magnet.

Each definition of the horizontal component consisted of four measurements of the angular deviation made with two magnets at two different points on a bus. The following C_T values were used in the processing:

Magnet	Distance on bus (mm)	C_T	t
"Combine" No. 17			
17	250	0.04345	0°
17	250	0.04407	-40
28	250	0.04121	0
28	250	0.04176	-40
17	295	0.02639	0
17	295	0.02669	-40
28	295	0.02501	0
28	295	0.02521	-40
"Bamberg" No. 70018			
One point	200	0.03713	+20
	200	0.03760	-20
One point	200--264	0.02420	+20
	200--264	0.02444	-20
One point	358	0.00645	+20
	358	0.00655	-20
Two points	264	0.02507	+20
	264	0.02535	-20
Two points	358	0.01011	+20
	358	0.01018	-20

The vertical component was defined by M-2 magnetometers. The constants used for these instruments are shown below:

Instrument No.	Multiplying factor ($\gamma/\text{fct.}$)	Zero-point value
15077	102.7 to 7/25/59 103.5 from 7/25 to end of drift	0.56808
4115	98.4 to 5/5/59 97.5 from 5/5 to 5/15/59 96.6 from 5/15 to end of drift	0.56800
6353	104.8	0.56160 to 7/1 0.56060 from 7/1 to 7/24 0.55990 from 7/24 to 8/18 0.55955 from 8/18 to end of drift

12172	101.4 from beginning of drift to II 1960 102.6 from II 1960 to end of drift	0.56852
12151	101.4 from beginning of drift to 9/2/59 102.3 from beginning of drift to 10/31/59	0.56892
7691	118.6 to Oct. 1959 120.1 from Oct 1959 to end of drift	0.56532

The multiplying factors of the magnetometers were defined once a week by means of deflector magnets. A correction for the changing force of gravity, depending on the latitude of the observation point, was introduced in the zero-point values of the instruments. At the "Severnny Polyus-6" that correction amounted to +70γ, and "Severnny Polyus-8" +72γ.

The MVS (magnetic variation stations) were used for the continuous recording of the magnetic field elements, and kept in operation a week at a time. The variations were recorded on a positive film which was then printed and magnified about 6 times. The film moved at a speed of 3 mm/hour. An electric circuit was used to determine the multiplying factor of the variometers. The multiplying factor of the D-variometer, expressed in degrees per millimeter (on the prints), was computed by the following formula

$$E_D^{\circ} = \frac{E_D^{\gamma}}{H \cdot \sin 1^{\circ} \cdot 60}.$$

The multiplying factors of the variometers and temperature coefficients used for processing purposes are cited below:

MVS	E_D (γ/mm)	E_H (γ/mm)	E_Z (γ/mm)	M_D (γ/deg)	M_H (γ/deg)	M_Z (γ/deg)
ANII-13 (base)	7.3	7.4	7.3	2.2 under- compensa- tion	2.8 over- compensa- tion	1.2 under- compensa- tion
ANII-17 (standby)	14.1	13.8	12.3	0.0	0.0	0.0
ANII-2 (base)	9.3	6.6	8.3 from 11/1 to 12/11/59 8.9 from 12/14/59 to 6/1/60	0.0	0.8 under- compensa- tion	1.17 over- compensa- tion
NIFI-2 (standby)	8.2	10.0	10.3 from 5/1/59 to 3/28/60 15.2 from 3/28 to 6/1/60	0.0	6.8 over- compensa- tion	6.0 over- compensa- tion

The base positions of the variometers are computed with the following mean error (for the base stations):

	<u>Severnny Polyus-6</u>	<u>Severnny Polyus-8</u>
H-variometer	$\pm 10\gamma$	$\pm 14\gamma$
Z-variometer	$\pm 14\gamma$	$\pm 18\gamma$
D-variometer	± 0.2	± 0.2

An ANII-13 instrument was used to process the variation observations of the base MVS of "Severnny Polyus-6," while an ANII-17 was used only from the 7th to the 13th July by the standby MVS when there was no recording at the base station. For technical reasons, the magnetic observations from the drifting station "Severnny Polyus-8" began after a considerable delay. The MVS went into operation on 24 May 1959. The observation data of the vertical component were processed only beginning with 1 August.

The results of the observation processing are shown in the following tables: Table 1 contains the hourly values of the magnetic elements D, H and Z; Table 2 shows the hourly amplitude values of the horizontal component

r_H^Y ; the observed values of the magnetic elements D, H and Z are listed in Table 3.

Tables 1 and 2 also show the maximum coordinates of the station's drift in the course of a given month. The Greenwich (world) mean time is indicated in all the Tables.

The processing of the observation data at "Severnny Polyus-6" was done by engineer G. I. Korobkova, and at "Severnny Polyus-8" by senior engineer L. P. Struina under the supervision of junior scientist Korokin.